

Appl. No 10/587,850. Amdt. dated Nov 24,2008 Reply to Notice of Non-Compliant Amdt Oct 27,2008

Claims

1 (Canceled)

2 (Currently amended): ~~Cross-polarizing system~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim + 29, said polarization layers P_i being cartesian polarizers, characterized by having their polarization planes selectable independently from the plane of incidence, and said polarization layers P_i being arranged in planes which are perpendicular to a common ground plane, and all said optical axes being coplanar to a common ground plane.

3 (Currently amended): ~~Cross-polarizing system~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim 2, said polarizing layer vector V_1 of P_1 and said polarizing layer vector V_2 of P_2 being perpendicular to each other.

4 (Currently amended): ~~Cross-polarizing system~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim 3, said polarizing layers P_2 and P_3 forming a common polarization layer.

5 (Currently amended): ~~Cross-polarizing system~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim + 29, comprising

5-1 comprising at least one right triangular prism ~~(with all lateral surfaces perpendicular to its footprint)~~ with a triangular footprint composed of two right prisms ~~(with all lateral surfaces perpendicular to the footprint)~~ T_1 and T_2 each with an isosceles triangular footprint, base;

5-2 the lateral surface of sub-prism T_2 in-between the two sub-prisms carrying a cartesian polarization layer P_1 [[L]];

5-3 the lateral surface of subprism T_1 , which together with a lateral surface of subprism prism T_2 forms a common lateral surface of the ~~compound~~ said composed prism, carrying a cartesian polarization layer P_2 .

6 (Currently amended): ~~Cross-polarizing system~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim + 29, comprising containing at least a right prism ~~(with all lateral surfaces perpendicular to its footprint)~~ with an isosceles triangular footprint base ; the two lateral surfaces of equal size of said prism carrying mutually

Appl. No 10/587,850 Amdt. dated Nov 24,2008 Reply to Notice of Non-Compliant Amdt Oct 27,2008

complementary polarizations layers.

7 (Currently amended): ~~Cross-polarizing system~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim 1 ~~29,~~
comprising an additional fourth polarization layer P4 which together with said P2
along a third optical axis A3 and together with said P3 along a fourth optical
axis A4 constitutes an additional cross-polarizer according to claim 1.

8 (Currently amended): ~~Cross-polarizing system~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim 7,
polarization layers P1 and P4 having parallel polarizing layer vectors and being
coplanar within a common plane E1, and the polarization layers P2 and P3 having
parallel polarizing layer vectors and being coplanar within a common plane E2,
and E1 and E2 all four layers having an intersection line where all four
polarization layers meet.

9 (Withdrawn - currently amended): ~~Utility for reciprocal polarization with mutually complementary polarizing layers (cross-polarizer), distinguished by~~
Complex polarizer system for reciprocal polarization (cross-polarizer) comprising
~~9.1 comprising at least two polarizing layers P_i ($i=1,2,\dots$); $[[,]]$~~
~~said layers each possessing P_i characterized by a normal vector N_i normal to P_i~~
~~and a polarizing layer vector V_i coplanar to P_i ; $[[,]]$~~
said P_i having beam splitting properties, which split an incident beam into a
transmitting and a reflected beam;
~~said V_i together with the optical axis of incidence and reflection of P_i defining which~~
~~directions of polarization of the electromagnetic radiation incident on P_i will~~
~~be reflected (polarizing reflexion) resp. will transmit P_i (polarizing~~
~~transmission) such that V_i together with the axis of reflexion of P_i span the~~
plane of polarization of and the reflected beam spanning the plane of
polarization of the reflected beam;
~~and said V_i together with the axis of incidence of P_i span a plane and the~~
transmitting beam spanning a plane perpendicular to the plane of
polarization of the transmitting beam;
~~9.2 polarizing layers~~
P1 and P2 a further polarizer being arranged along a first optical path S1, which
is folded by n reflecting means ($n=1,2,3,\dots$) such that the plane E1 $[[,]]$ which
is spanned by V1 and the optical axis of S1 in P1, and the plane E2 $[[,]]$ which

Appl. No 10/587,850 Amdt. dated Nov 24,2008 Reply to Notice of Non-Compliant Amdt Oct 27,2008

is spanned by $\sqrt{2}$ the polarizing layer vector of said further polarizer and the optical axis of S1 in P2 ~~said further polarizer;~~ have a correlation such that the mirrored plane E1*, which is derived from E1 by successive reflexions at said n reflecting means, is perpendicular to E2 (designated by the term „mutual complementarity“ of P1 and P2),
said two polarizing layers being mutual complementary, characterized by the plane E1*, derived from E1 by optional means for folding, being perpendicular to E2;

~~9.3 polarizing layers~~

P1 and P2 ~~a further polarizer~~ being arranged along a second optical path S2;
~~which may be folded by n reflecting means (n=0,1,2,...) such that the plane E3[[,]] which is spanned by V1 and the optical axis of S2 in P1, and a plane E4[[,]] which is spanned by $\sqrt{2}$ the polarizing layer vector of said further polarizer and the optical axis of S2 in P2~~ said further polarizer; ~~have a correlation such that the mirrored plane E3*, which is derived from E3 by successive reflexions at said n reflecting means, is perpendicular to E4 (designated by the term „mutual complementarity“ of P1 and P2),~~
said two polarizing layers being mutual complementary, characterized by the plane E3*, derived from E3 by optional means for folding, being perpendicular to E4;

~~9.4~~ said two optical paths S1 and S2 intersecting in P1 with equal cutting angles between N1 and S1 and between N1 and S2[[,]];

~~9.5~~ the architecture of the system coupling the transmission at P1 along S1 to a reflection at the further polarizer along S1 and the corresponding reflection at P1 to a transmission at P2 the further polarizer along S2.

10 (Withdrawn - currently amended): ~~Utility for reciprocal polarization with mutually complementary polarizing layers (cross-polarizer), distinguished by~~
Complex polarizer system for reciprocal polarization (cross-polarizer) comprising
~~10.1 comprising at least three polarizing layers Pi (i=1,2,3,...)[[,]];~~

~~each of said layers possessing Pi characterized by a normal vector Ni normal to Pi and a polarizing layer vector Vi coplanar to Pi; [[,]]~~
said Pi having beam splitting properties, which split an incident beam into a transmitting and a reflected beam;

~~said Vi together with the optical axis of incidence and reflection of Pi defining which directions of polarization of the electromagnetic radiation incident on Pi will be reflected (polarizing reflexion) resp. will transmit Pi (polarizing~~

Appl. No 10/587,850 Amdt. dated Nov 24,2008 Reply to Notice of Non-Compliant Amdt Oct 27,2008

~~transmission) such that V_i together with the axis of reflexion of P_i span the plane of polarization of and the reflected beam spanning the plane of polarization of the reflected beam;~~

~~and said V_i together with the axis of incidence of P_i span a plane and the transmitting beam spanning a plane perpendicular to the plane of polarization of the transmitting beam;~~

~~10.2 polarizing layers~~

~~P1 and P2 being arranged along a first optical path S_1 , which is folded by n reflecting means ($n=1,2,3,\dots$) such that the plane $E1[.,.]$ is spanned by $V1$ and the optical axis of S_1 in $P1$, and the plane $E2[.,.]$ which is spanned by $V2$ and the optical axis of S_1 in $P2$; ,have a correlation such that the mirrored plane $E1^*$, which is derived from $E1$ by successive reflexions at said n reflecting means, is perpendicular to $E2$ (designated by the term „mutual complementarity“ of $P1$ and $P2$),~~

said polarizing layers P1 and P2 being mutual complementary, characterized by the plane $E1^*$, derived from $E1$ by optional means for folding, being perpendicular to $E2$;

~~10.3 polarizing layers~~

~~P1 and P3 being arranged along a second optical path S_2 , which may be folded by n reflecting means ($n=0,1,2,\dots$) such that the plane $E3[.,.]$ which is spanned by $V1$ and the optical axis of S_2 in $P1$, and a plane $E4[.,.]$ which is spanned by $V3$ and the optical axis of S_2 in $P3$; ,have a correlation such that the mirrored plane $E3^*$, which is derived from $E3$ by successive reflexions at said n reflecting means, is perpendicular to $E4$ (designated by the term „mutual complementarity“ of $P1$ and $P2$),~~

said polarizing layers P1 and P3 being mutual complementary, characterized by the plane $E3^*$, derived from $E3$ by optional means for folding, being perpendicular to $E4$;

~~10.4 said two optical paths S_1 and S_2 intersecting in $P1$ with equal cutting angles between $N1$ and S_1 and between $N1$ and $S_2[.,.]$;~~

~~10.5 the architecture of the system coupling the transmission at $P1$ along S_1 to a reflection at $P2$ and the corresponding reflection at $P1$ to a transmission at $P3$ along S_2 .~~

- 11 (Withdrawn - currently amended): Cross-polarizing system Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim 10, comprising an additional fourth polarizing layer $P4$, which together with said $P2$

Appl. No 10/587,850 Amdt. dated Nov 24,2008 Reply to Notice of Non-Compliant Amdt Oct 27,2008

along a third optical path S3 and together with said P3 along a fourth optical path S4 constitutes an additional cross-polarizer according to claim 10.

- 12 (Currently amended): ~~Gross-polarizing system~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim ~~10~~ 29, at least one of said layers Pi being a doubled or two-sided cartesian polarizer with parallel layer vectors Vi.
- 13 (Currently amended): ~~Gross-polarizing system~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim ~~10~~ 29, all of said Pi being cartesian polarizers, e.g. wire grid polarizers.
- 14 (Currently amended): ~~Gross-polarizing system~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim ~~10~~ 29, all of said Pi being thin-film polarizers ~~working according to Brewster's law of the MacNeille type.~~
- 15 (Currently amended): ~~Gross-polarizing system~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim ~~10~~ 29, all of said Pi being contained in a body and the optical paths into and out of the cross-polarizing system being made possible by windows or openings.
- 16 (Currently amended): ~~Utility for the light architecture in a two-channel display system, distinguished by~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim 29, further comprising
~~16.1 comprising at least one cross-polarizing system according to claim 10,~~
~~16.2 comprising at least one two spatial light modulators in each channel,~~
~~16.3 one of said cross said polarizing system[[s]] being used to feed the spatial light modulators with polarized light.~~
- 17 (Currently amended): ~~Utility for the light architecture in a two-channel display system, distinguished by~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim 29, further comprising
~~17.1 comprising at least one cross-polarizing system according to claim 10,~~
~~17.2 comprising at least one two spatial light modulators in each channel,~~
~~17.3 one of said cross said polarizing system[[s]] being used to superpose the modulated light from the spatial light modulators.~~

Appl. No 10/587,850 Amdt. dated Nov 24,2008 Reply to Notice of Non-Compliant Amdt Oct 27,2008

18 (Currently amended): ~~Utility for the light architecture in a two-channel display system, distinguished by~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim 29, further comprising

~~18.1 comprising a cross-polarizing system according to claim 10,~~

~~18.2 comprising at least one two spatial light modulator of the type micro-electro-mechanical-system (MEMS, e.g. DMD by Texas Instruments) in each channel, ;~~

~~18.3 said cross-polarizing system being used to both feed the spatial light modulators with polarized light and to superpose the modulated light from the spatial light modulators[.];~~

~~18.4 the plane of incidence in said P1 intersecting the plane of superposition with an angle different from 0 degree.~~

19 (Withdrawn - currently amended): ~~Utility for the light architecture in a two-channel display system, distinguished by~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim 9, further comprising

~~19.1 comprising a cross-polarizing system according to claim 9,~~

~~19.2 comprising at least one spatial light modulator in each channel positioned in said optical paths S1 and S2 between P1 and P2.~~

20 (Currently amended): ~~Utility for the light architecture in a two-channel display system, distinguished by~~ Complex polarizer system for reciprocal polarization (cross-polarizer) according to claim 15, further comprising

~~20.1 comprising a cross-polarizing system according to claim 15,~~

~~20.2 comprising at least one spatial light modulator in each channel which is mounted to the body.~~

21 (Currently amended): Complex polarizer system for reciprocal polarization (cross-polarizer) Cross-polarizing system according to claim 1, 29,

comprising at least one right triangular prism (where the lateral surfaces are perpendicular to the footprint) with the footprint of a triangle, ;

said prism being which is composed of two right triangular sub-prisms with the base of an isosceles triangle each, such that with a thin-film type polarizing layer P1 with its layer vector V1 being is situated between these two sub-prisms[.]; and

the lateral surface of the compound prism that which consists of two lateral surfaces of the sub-prisms[.]; carries carrying a cartesian polarizing layer P2

Appl. No 10/587,850 Amdt. dated Nov 24,2008 Reply to Notice of Non-Compliant Amdt Oct 27,2008

with the its layer vector V2;
V2 being perpendicular to V1.

- 22 (Currently amended): Complex polarizer system for reciprocal polarization (cross-polarizer) Cross-polarizing system according to claim + 29, comprising at least one right triangular prism ~~(where the lateral surfaces are perpendicular to the footprint)~~ with the footprint of a triangle, ; said prism being which is composed of two right triangular sub-prisms with the footprint base of an isosceles triangle each, such that with a cartesian type polarizing layer P1 with its layer vector V1 being is-situated between these two sub-prisms[.]; and the lateral surface of the compound prism that which consists of two lateral surfaces of the sub-prisms[.]; carries carrying a cartesian polarizing layer P2 with the its layer vector V2 perpendicular to V1.
- 23 (Currently amended): Complex polarizer system for reciprocal polarization (cross-polarizer) Cross-polarizing system according to claim + 29, comprising at least one right triangular prism ~~(where the lateral surfaces are perpendicular to the footprint)~~ with the footprint of a triangle, ; said prism being which is composed of two right triangular sub-prisms T1a, T1b with the footprint base of an isosceles triangle each[.]; such that those lateral surfaces of the compound prism, which that consist[.]; of only one lateral surface of the sub-prisms, carries carrying polarization layers P1 and P2.
- 24 (Currently amended): Complex polarizer system for reciprocal polarization (cross-polarizer) Cross-polarizing system according to claim + 29, comprising at least one right triangular prism ~~(where the lateral surfaces are perpendicular to the footprint)~~ with the footprint of a triangle, ; said prism being which is composed of two right sub-prisms with the footprint base of an isosceles triangle each[.]; such that a thin-film type polarizing layer P1 is being situated between these two sub-prisms.
- 25 (Currently amended): Complex polarizer system for reciprocal polarization (cross-polarizer) Cross-polarizing system according to claim + 29,

Appl. No 10/587,850 Amdt. dated Nov 24,2008 Reply to Notice of Non-Compliant Amdt Oct 27,2008

all cartesian polarizing layers being doubled or two-sided.

26 (New): Method of using a cross-polarizer according to claim + 29.

27 (New): Method for reciprocal polarization (cross-polarization),
using a light source;
using three polarization beam splitting layers $P_{trans1ref1}$, with a polarizing layer
vector $V_{trans1ref1}$, P_{ref2} , with a polarizing layer vector V_{ref2} , and P_{trans2} , with a
polarizing layer vector V_{trans2} ;
using the optical axis A_{trans1} and the optical axis A_{ref1} which is derived from
 A_{trans1} by mirroring A_{trans1} at the plane of $P_{trans1ref1}$;
using a polarized beam $B_{trans1ref2}$, which transmits $P_{trans1ref1}$ along A_{trans1} ,
located between $P_{trans1ref1}$;
using a polarized beam $B_{ref1trans2}$, which is reflected at $P_{trans1ref1}$ along A_{ref1} ;
arranging $B_{trans1ref2}$ and $B_{ref1trans2}$ such that they form a common beam with both
polarization components of $B_{trans1ref2}$ and $B_{ref1trans2}$ on one side of $P_{trans1ref1}$;
choosing $V_{trans1ref1}$ such that the plane of polarization of $B_{trans1ref2}$ is
perpendicular to the plane spanned by $V_{trans1ref1}$ and A_{trans1} , and that the
plane of polarization of $B_{ref1trans2}$ is spanned by A_{ref1} and $V_{trans1ref1}$;
guiding $B_{trans1ref2}$ on an optical path between $P_{trans1ref1}$ and P_{ref2} ;
arranging P_{ref2} such that the optical path of $B_{trans1ref2}$ leads to P_{ref2} in the optical
axis A_{ref2} ;
arranging P_{ref2} such that $B_{trans1ref2}$ is reflected at P_{ref2} by choosing V_{ref2} such that
the plane of polarization of $B_{trans1ref2}$ is spanned by A_{ref2} and V_{ref2} , therefore
coupling the transmission of $B_{trans1ref2}$ at $P_{trans1ref1}$ to a reflection of
 $B_{trans1ref2}$ at P_{ref2} ;
guiding $B_{ref1trans2}$ on an optical path between $P_{trans1ref1}$ and P_{trans2} ;
arranging P_{trans2} such that the optical path of $B_{ref1trans2}$ leads to P_{trans2} in the
optical axis A_{trans2} ;
arranging P_{trans2} such that $B_{ref1trans2}$ transmits P_{trans2} by choosing V_{trans2} such that
the plane of polarization of $B_{ref1trans2}$ is perpendicular to the plane spanned
by A_{trans2} and V_{trans2} , therefore coupling the reflection of $B_{ref1trans2}$ at
 $P_{trans1ref1}$ to a transmission of $B_{ref1trans2}$ at P_{trans2} .

28 (New): Method for reciprocal polarization (cross-polarization),
using a light source;

Appl. No 10/587,850 Amdt. dated Nov 24,2008 Reply to Notice of Non-Compliant Amdt Oct 27,2008

using four polarization beam splitting subprocesses (either a polarizing transmission or a polarizing reflection at a polarizing beam splitting layer) P_{trans1} , P_{ref1} , P_{ref2} , P_{trans2} ;
 using a polarized beam $B_{trans1ref2}$, transmitting at the process P_{trans1} ;
 using a polarized beam $B_{ref1trans2}$, which is reflected at P_{ref1} ;
 said P_{trans1} and P_{ref1} subprocesses being the polarizing transmission subprocess and polarizing reflection subprocess of a common polarization split process;
 sending $B_{trans1ref2}$ through the polarizing reflection subprocess P_{ref2} , thus coupling the polarizing transmission P_{trans1} of $B_{trans1ref2}$ to the polarizing reflection P_{ref2} of $B_{trans1ref2}$;
 sending $B_{ref1trans2}$ through the polarizing transmission subprocess P_{trans2} , thus coupling the polarizing reflection P_{ref1} of $B_{ref1trans2}$ to the polarizing transmission P_{trans2} of $B_{ref1trans2}$.

29 (New): Complex polarizer system for reciprocal polarization (cross-polarizer), comprising an arrangement of
 three polarizing beam splitting layers P_i ($i=1,2,3$);
 the position of each of said P_i described by its unit normal vector N_i and its position vector L_i ;
 the polarization beam splitting characteristics of P_i described by a polarizing layer vector V_i coplanar to P_i such that light incident on P_i in L_i along an arbitrary incidence vector T_i is split into a transmitted beam with the plane of polarization trans-POP: $((T_i \times V_i) \times T_i) \cdot (\chi - L_i) = 0$, and a reflected beam (the according reflection vector being described by $R_i = T_i - 2(T_i \cdot N_i)N_i$) with the plane of polarization ref-POP: $(R_i \times V_i) \cdot (\chi - L_i) = 0$, with $(a \cdot b)$ being the scalar product of the two vectors a and b and with $(a \times b)$ being the cross product of the two vectors a and b ;
 one axis, described by axis vector A_1 and said L_1 ;
 P_1 and A_1 defining
 the axis vector A_2 , which is A_1 reflected on P_1 in L_1 ,
 $[A_2 = A_1 - 2(A_1 \cdot N_1)N_1]$;
 the plane E_1 $[(V_1 \times A_1) \cdot (\chi - L_1) = 0]$;

Appl. No 10/587,850 Amdt. dated Nov 24,2008 Reply to Notice of Non-Compliant Amdt Oct 27,2008

the plane E3 $[(V1 \times A2) \circ (\mathcal{X} - L1) = 0]$;

P2 being arranged relative to said P1 and said A1 such that

plane E2 $[(V2 \times A1) \circ (\mathcal{X} - L2) = 0]$ is perpendicular to plane E1

$[L2 = L1 + d2 * A1; (V2 \times A1) \circ (V1 \times A1) = 0]$;

P3 being arranged relative to said P1 and said A2 such that

plane E4 $[(V3 \times A2) \circ (\mathcal{X} - L3) = 0]$ is perpendicular to plane E3

$[L3 = L1 + d3 * A2; (V3 \times A2) \circ (V1 \times A2) = 0]$.

30 (New): Complex polarizer system for reciprocal polarization (cross-polarizer), comprising an arrangement of three polarizing beam splitting layers P_i ($i=1,2,3$); the polarizing beam splitting characteristics of said P_i being described by a polarizing layer vector V_i coplanar to P_i such that linearly polarized light incident on P_i is maximally reflected if its plane of polarization is coplanar to V_i ; positioning said three layers such that there exists at least one position vector L_i pointing to a point in each P_i so that

$$[V2 \times (L2-L1)] \circ [V1 \times (L2-L1)] = 0 \quad (\text{coupling of } P1 \text{ and } P2);$$

$$[V3 \times (L3-L1)] \circ [V1 \times (L3-L1)] = 0 \quad (\text{coupling of } P1 \text{ and } P3);$$

$$k (L3-L1) = (L2-L1) - 2 [(L2-L1) \circ N1] N1 \quad (\text{coupling of the two couplings});$$

with $N1$ being the unit normal vector of $P1$, and $(a \circ b)$ being the scalar product of the two vectors a and b , and $(a \times b)$ being the cross product of the two vectors a and b .